I claim:

1. A dual-mode mobile communications unit comprising:

means for receiving from and means for transmitting to a land-based network station Time Division Multiple Access signal bursts in an allocated timeslot of a TDMA frame having a first plurality of timeslots for transmission and reception and adapted in another mode for transmitting to an orbiting relay station Time Division Multiple Access signal bursts in an allocated timeslot of a TDMA frame having a second plurality of timeslots for transmission and said second plurality is lower than said first plurality.

2. A method of communicating information using Time Division Multiple Access and adaptive transmission and reception, comprising the steps of:

transmitting signal bursts from TDMA transmission means to a TDMA receiving means wherein said transmission means codes said information and transmits coded information to said receiving means using at least one of two timeslots of a plurality of timeslots in a repetitive TDMA frame period;

receiving both of said two timeslots whether or not said transmitting means has transmitted using said one or said two timeslots and classifying received signals as intended and non-intended;

assembling successively received signals classified as intended into a block for decoding;

decoding said block to reproduce said information.

3. A method of communicating information according to claim 2, wherein said transmission means codes said information using a convolutional code.

4. A method of communicating information according to claim 2 wherein said transmission means inserts a known symbol pattern into said coded information for transmission.

5. A method of communicating information according to claim 4 wherein said receiving means classifies said received signals as intended and not intended based upon detection of said known pattern.

6. A method of communicating information according to claim 2, wherein said burst transmission means uses said two time slots when determined to be required by said TDMA receiving means in order to obtain good decoded information quality and said burst transmission means uses one time slot when it is determined that one timeslot provides a good decoded information quality.

7. A method of communicating information according to claim 2, wherein said burst transmitter means when using said two timeslots repeats in a second of said two timeslots transmissions of coded symbols already transmitted in a first of said two timeslots.

8. A method of communicating information according to claim 2, wherein said burst transmitter means when using said two timeslots transmits in the second of said two timeslots at least some information symbols coded in a second manner that were already transmitted in the first of said two timeslots coded in a first manner.

9. A method of communicating information according to claim 8, wherein said first manner of coding comprises selecting half of the output bits of an error correction coder when the input bits to said coder are said at least some information symbols and said second manner of coding comprises selecting the other half of said output bits.

10. A method of communicating information according to claim 2, wherein said TDMA burst transmission means when using said two timeslot transmission comprises a first TDMA transmission means for transmitting on the first of said two timeslots and a second, separate TDMA transmission means for transmitting on the second of said two timeslots.

11. A method of communicating information according to claim 10, wherein said first and second TDMA transmission means are not co-located.

12. A method of communicating information according to claim 10, wherein said first and second TDMA transmission means respectively comprise a first and a second orbiting satellite relay station.

13. A method of communicating information according to claim 10, wherein said first and second TDMA transmission means respectively comprise a first and a second airborne relay station.

14. A method of communicating information according to claim 10, wherein said first and second TDMA transmission means respectively comprise a first and a second cellular base station transmitter.

15. A method of communicating information according to claim 14, wherein said first and second cellular base station transmitter are connected to separate sector inputs of a sectorized transmit antenna.

16. A method of communicating information according to claim 11, wherein said first and second TDMA transmission means comprise different cellular base stations and sites.

17. A method of communicating information according to claim 10, wherein said two timeslot transmission is employed when said TDMA burst receiving means is located in a handover regime between said first and second TDMA burst transmission means.

18. A TDMA communication apparatus with improved transmitter power level control, comprising:

burst receiving means for receiving TDMA signal bursts in an allocated receive timeslot of a repetitive TDMA frame period and for measuring received signal strength;

burst transmission means for transmitting TDMA signal bursts in an allocated transmit timeslot of a repetitive TDMA frame period under control of a power control means; and

transmit power control means for computing a desired effective burst transmission power level to compensate for propagation path changes based on said measured received signal strength and controlling said burst transmission means to transmit a signal burst at a controlled power level in said allocated transmit timeslot in each of said TDMA frame periods.

19. A TDMA communications apparatus according to claim 18, wherein said transmit power control means controls said burst transmission means to skip transmission in certain frame periods such that the combination of said controlled power level with the average fraction of frames transmitted provides an effective communication transmit power level equal to said computed desired power level.

20. A TDMA communications apparatus according to claim 19, wherein said certain frame periods are the odd-numbered frame periods.

21. A TDMA communications apparatus according to claim 19, wherein said certain frame periods are the even-numbered frame periods.

22. A TDMA communications apparatus providing an improved transmit and receive diversity operation, comprising:

coding means for coding an information bitstream such that for every information bit input to said coder a plurality of coded output bits are generated;

first TDMA burst transmission means for transmitting half of said plurality of coded bits using a first TDMA timeslot of a repetitive frame period and a first sequence of radio channel frequencies;

second TDMA burst transmission means for conditionally transmitting the other half of said plurality of coded bits using a second timeslot of a repetitive frame period and a second sequence of radio channel frequencies;

TDMA receiving means for receiving on said first timeslot on a frequency in said first frequency series alternately with receiving on said second timeslot on a frequency in said second series and producing demodulated output signals to a decoder; and

decoding means for classifying said output signals received respectively in said first and said second timeslots as intended and non-intended and decoding signals classified as intended to reproduce said information bitstream.

23. The TDMA communications apparatus according to claim 22, wherein said conditional transmission by said second TDMA burst transmission means is based on the signal quality decoded by said TDMA receiving means.

24. A portable satellite communications terminal using time division multiple access, comprising:

TDMA burst receiving means for receiving and analyzing signal bursts received in a receive timeslot of a repetitive TDMA frame period and producing decoded information and a signal quality indication;

TDMA burst transmitting means for coding information and said signal quality indication to produce coded signal bursts for transmission and transmitting said coded bursts in an allocated transmit timeslot of even-numbered TDMA frames and conditionally transmitting coded bursts in an allocated timeslot of odd-numbered TDMA frames in dependence on said signal quality indication.

25. A portable satellite communications terminal using time division multiple access comprising:

TDMA burst receiving means for receiving and analyzing signal bursts received in a receive timeslot of a repetitive TDMA frame period and producing decoded information containing mode commands; and

TDMA burst transmitting means for coding information and said signal quality indication to produce coded signal bursts for transmission and transmitting coded bursts in an allocated transmit timeslot of even-numbered TDMA frames and conditionally transmitting coded bursts also in an allocated timeslot of odd-numbered TDMA frames in dependence on said mode commands.

26. A portable satellite terminal according to claim 25, further comprising:

means for changing the radio channel frequency of said TDMA burst receiving means between successive TDMA frames.

27. A portable satellite terminal according to claim 25, further comprising:

means for changing the radio channel frequency of said TDMA burst transmission means between said even and odd-numbered frames.

28. A portable satellite terminal according to claim 25, further comprising:

means for maintaining timing synchronization of said TDMA burst receiving means independently for receiving signal bursts in respectively even and odd-numbered frames.

29. A portable satellite communications terminal using time division multiple access, comprising:

TDMA burst receiving means synchronized by synchronizing means to receive and analyze signal bursts received in allocated receive timeslots of a repetitive TDMA frame period and to produce decoded information and a signal quality indication;

synchronizing means for synchronizing said TDMA burst receiving means independently for even-numbered and odd-numbered ones of said TDMA frame periods; and

TDMA burst transmitting means for coding information and said signal quality indication to produce coded signal bursts for transmission and transmitting coded bursts in allocated transmit timeslots in said repetitive TDMA frame period.

30. A communications system for providing a communications service to a plurality of first stations with the aid of a network of relay stations each of said relay stations, comprising:

coding means for coding data for transmission to said first stations to produce signal bursts;

TDMA burst transmission means for relaying said signal bursts to each of said first stations using respective timeslots of a repetitive TDMA frame period such that each of said first stations receives signal bursts in its respective timeslot;

detection means for detecting when no data is temporarily required to be sent to one of said first stations; and

means controlled by said detection means to transmit signal bursts intended for another of said first stations in the timeslot designated for said one of said first stations temporarily receiving no data as well as transmitting signal bursts in said another station's designated timeslot.

31. A communications system for relaying digitally coded voice signals to each of a plurality of remote stations, comprising:

voice coding means for digitizing and coding voice signals to produce frames of digital data containing a fixed number of bits representing a segment of the voice signal over a time period and producing an associated voice/no voice flag;

error correction coding means for coding each of said voice frames to produce a first coded symbol block and a second coded symbol block each representing a respective one of said speech frames;

TDMA burst transmission means for relaying said first coded symbol blocks to respectively intended remote stations using an allocated timeslot in a repetitive TDMA frame period; and

control means for controlling said burst transmission means to replace a first coded symbol block when said associated flag indicates the no-voice condition by a second coded symbol block intended for a different remote station.

32. The communications system according to claim 31, further comprising:

remote station TDMA burst receiving and decoding means for receiving said coded symbol blocks in a respectively allocated timeslot and an alternate slot and detecting whether said symbol block received in said allocated slot is an intended one of said first coded symbol blocks.

33. The communications system according to claim 32, wherein said remote station TDMA burst receiving and decoding means further detects detecting whether said symbol block received in said alternate slot is an intended one of said second coded symbol blocks.

34. The communications system according to claim 33, wherein said TDMA burst decoding means upon detecting an intended first coded symbol block and an intended second coded symbol block jointly decodes both blocks to give an enhanced probability of correctly reproducing said voice signal segment else decodes only said first coded block if detected to be intended and said second coded block is not detected to be intended.

35. An improved method of radio communications between a network comprising at least two relay stations and a plurality of remote stations using frequency hopping time-division multiple access comprising the steps of:

transmitting signals from one of said relay stations to a specific one of said remote stations in a designated timeslot of a repetitive TDMA frame period using a radio channel selected for each successive frame period using a first frequency hopping sequence generator; and

transmitting signals from another of said relay stations to said specific one of said remote stations in a designated alternate timeslot of said repetitive TDMA frame period using a radio channel selected for each successive frame period using a second frequency hopping sequence generator.

36. A method of communication according to claim 35, wherein said first and second frequency hopping sequence generators select frequencies from different frequency sets.

37. A method of communications according to claim 35, wherein said first and second frequency hopping sequence generators select frequencies orthogonally from the same set.

38. A method of communications according to claim 35, wherein said first frequency hopping sequence generator generates a number of mutually orthogonal sequences and said successively selected radio channels for said specific remote station belong to one of said orthogonal sequences and the other orthogonal sequences are used by other remote stations.

39. A time division multiple access format for transmitting traffic and signalling data between a network station and a plurality of remote stations, comprising the steps of:

dividing a superframe period into an odd number of TDMA frame periods;

dividing each TDMA frame period into an even number of timeslots;

using said even number of timeslots in one of said odd number of TDMA frames for transmitting signalling information addressed respectively to a corresponding even number of remote stations and the remaining TDMA frames in said superframe for transmitting traffic information;

dividing said remaining number of frames used for transmitting traffic information into a first group of traffic frames and a second group of traffic frames; and

using said even number of timeslots in said first group of traffic frames to transmit traffic data to a corresponding even number of remote stations and using the timeslots in said second group of traffic frames to transmit data to a corresponding number of other remote stations.

40. A method according to claim 39, wherein said signalling information comprises an indication whether said information is addressed to one of said remote stations for which traffic information was transmitted using a timeslot from each of said first group of traffic frames or for one of said remote stations for which traffic information was sent using a timeslot in said second group of traffic frames.

41. An adaptive time division multiple access format for transmitting traffic and signalling data between a network station and a plurality of remote stations, comprising the steps of:

dividing a superframe period into an odd number of TDMA frame periods;

dividing each TDMA frame period into an even number of timeslots;

using said even number of timeslots in one of said odd number of TDMA frames for transmitting signalling information to said remote stations and the remaining TDMA frames in said superframe for transmitting traffic information;

dividing said remaining number of frames used for transmitting traffic information into a first group of traffic frames and a second group of traffic frames; and

using one of said even number of timeslots in said first group of traffic frames to transmit traffic data to a first of said remote stations and using the corresponding timeslot in said second group of traffic frames to transmit data to another remote station alternatively in dependence on communications signal quality using both said timeslot in said first group of frames and said corresponding timeslot in said second group of frames for communicating with the same remote station.

42. A dual-mode satellite/cellular radio telephone system using TDMA comprising mobile stations, cellular network stations and satellite relay stations for transmitting TDMA signal bursts including the method of:

transmitting bursts in said TDMA format intended for a specific mobile station at a first repetition rate from a cellular network station alternatively at a

second repetition rate being a sub-multiple of said first repetition rate from a satellite relay station;

dividing bursts transmitted at said first repetition rate into superframe groups each comprising traffic bursts, a Slow Associated Control Channel burst and an idle frame not containing a transmitted information burst; and

using said idle frame at said specific mobile station to change its TDMA burst receiver channel frequency to that of a neighboring cellular network station or to the channel frequency of a satellite relay station and analyzing the signal received on that channel frequency.

43. A method according to claim 42, further comprising the step of:

reporting from said mobile station to said network station the results of said signal analysis.

44. A method according to claim 42, wherein said method further includes communicating said neighboring channel frequencies and said satellite relay station channel frequency from a network station to said mobile station.

45. A method according to claim 43, wherein said reported signal analyses are used at said network station to determine when said mobile station shall be switched to receive data from a satellite relay station instead of one of said network stations.

46. An improved method of capacity allocation in a TDMA satellite or cellular communications system comprising a number of areas containing mobile subscriber terminals each area being served by a respective antenna beam, said method comprising the steps of:

allocating each mobile terminal in each area a timeslot in a each TDMA frame period and a channel frequency in a frequency set for receiving data whereby mobiles in the same area receive different timeslot and frequency allocations and mobiles in different areas may share the same timeslot and frequency allocation;

transmitting coded information bits to a mobile terminal in a given area using a respectively allocated timeslot in every one of said TDMA frame periods when the total number of mobiles so served in said given area is similar to the number of mobiles served in surrounding areas and close to a mean number of mobiles expected in each area; and

transmitting coded information bits to a mobile terminal in a given area using a respectively allocated timeslot in every alternate one of said TDMA frame periods and using the corresponding timeslot in the other half of the frame periods for transmitting coded information to a different mobile terminal when the number of mobiles so served in said given area is substantially greater than said mean value and the number of mobiles served in adjacent areas is on average less than said mean value.

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